INDIAN SCHOOL AL WADI AL KABIR

UNIT TEST (2023 - 24)

Class: XII | Sub: CHEMISTRY (043) | Max Marks: 30

Date:28.05.2023 | Set - 1 | Time : 1 hour

General instructions:

(a) There are 15 questions in this question paper with internal choice.

(b) SECTION A consists of 8 multiple -choice questions carrying 1 mark each.

(c) SECTION B consists of 2 short answer questions carrying 2 marks each.

(d) SECTION C consists of 3 short answer questions carrying 3 marks each.

(e) SECTION D consists of 1 case - based question carrying 4 marks.

(f) SECTION E consists of 1 long answer question carrying 5 marks.

(g) All questions are compulsory.

(h) Use of log tables and calculators is not allowed.

SECTION A [1 X 8 = 8]

The following questions are multiple -choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

1. Name the reagent used to convert Butan-2-ol to Butan-2-one.

   (A) $NaBH_4$

   (B) $LiAlH_4$

   (C) CrO_3

   (D) Aqueous NaOH

2. Which of the following shows the correct order of increasing acid strength?

   (A) p-Cresol < Phenol < p-Nitrophenol

   (B) Phenol < p-Cresol < p-Nitrophenol

   (C) Phenol < p-Nitrophenol < p-Cresol

   (D) p-Nitrophenol < Phenol < p-Cresol

3. What are the compounds formed when Ethanol is heated with concentrated sulphuric acid at 413 K and at 443 K respectively?

   (A) Ethanal and Ethoxyethane

   (B) Ethene and Ethoxyethane

(C) Ethoxyethane and Ethene

(D) Ethanal and Ethanoic acid

4. Sulphuric acid is not used for the preparation of alkyl iodide from alcohols with KI. This is because

(A) Sulphuric acid is a strong oxidising agent

(B) Sulphuric acid is a strong dibasic acid

(C) Sulphuric acid is a strong reducing agent

(D) None of these

5. Among the isomeric alkanes of molecular formula C_5H_{12}, identify the one that on photochemical chlorination yields three isomeric monochlorides.

(A) Cyclopentane

(B) Pentane

(C) 2-Methylbutane

(D) 2,2-Dimethylpropane

6. Identify the product obtained when isobutyl chloride is reacted with sodium in presence of dry ether.

(A) 3,4-Dimethylhexane

(B) 3,4-Dimethyloctane

(C) 2,2,3,3-Tetramethylbutane

(D) 2,5-Dimethylhexane.

7. Given below are two statements labelled as Assertion (A) and Reason (R).

Assertion: Finkelstein reaction takes place in presence of dry acetone.

Reason: NaX formed during the reaction is precipitated in dry acetone and it facilitates the forward reaction.

(A) Both A and R are true and R is the correct explanation of A.

(B) Both A and R are true but R is not the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

8. Given below are two statements labelled as Assertion (A) and Reason (R).

Assertion: The C-O-C bond angle in ethers is slightly less than tetrahedral angle.

Reason: Due to the repulsive interaction between the two alkyl groups in ethers.

(A) Both A and R are true and R is the correct explanation of A.

(B) Both A and R are true but R is not the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

SECTION B [2X2=4]

This section contains 2 questions with no internal choice. The following questions are very short answer type and carry 2 marks each.

9. An alkyl halide (A), C_3H_7Br reacted with alcoholic KOH to give compound (B). Compound (A) when reacted with aq. NaOH gives (C) which on oxidation with CrO_3 gives a ketone (D), Give the structures of A, B, C and D.

10. Give the structures of final products expected from the following reactions:

a) Hydroboration of propene followed by oxidation with H_2O_2 in alkaline medium.

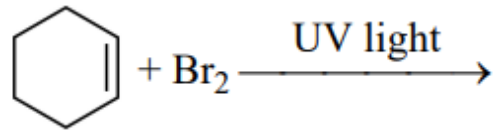
b) Dehydration of $(CH_3)_3C–OH$ by heating it with 20% H_3PO_4 at 358 K.

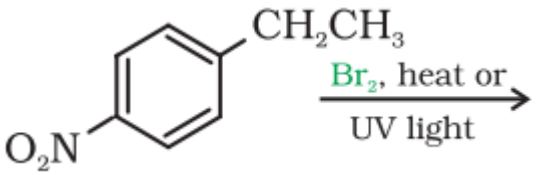
SECTION C [3X3=9]

This section contains 3 questions with an internal choice. The following questions are short answer type and carry 3 marks each.

11. a) How will you obtain Chlorobenzene from aniline?

b) Write the major mono halogen derivative of:

i) 

ii) 

12. a) Identify the Grignard reagent used for the preparation of following alcohols from Ethanal.

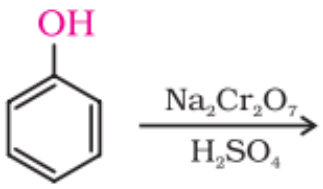
i) 3-Methylbutan-2-ol

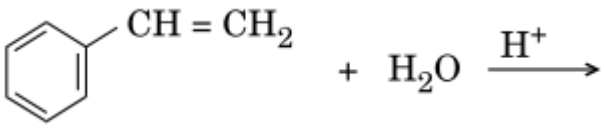
ii) 1-Phenylpropan-2-ol

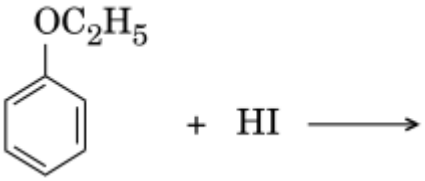
b) C-OH bond length in Methanol is slightly more than C-OH bond length in Phenol. Why?

OR

Write the structures of the main products in the following reactions:

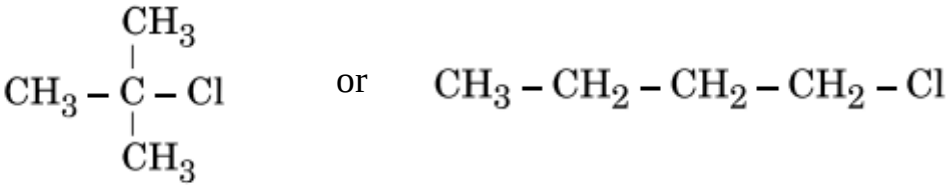
a) 

b) 

c) 

13. Answer the following questions:

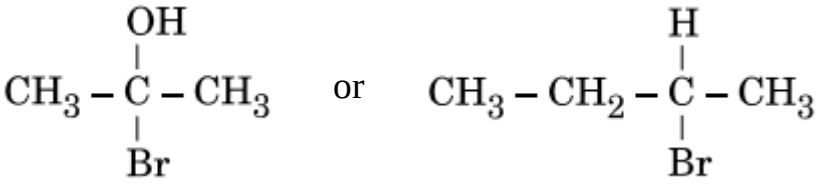
a) Which of the following has lower boiling point and why?



b) Which of the following is more reactive towards S_N1 reaction and why?

1-Bromopentane or 2-Bromo-2-methylbutane

c) Which of the following molecules is chiral in nature and why?



SECTION D [4 X 1 =4]

The following question is a case-based question. This question has an internal choice and carries 4 (1+1+2) marks. Read the passage carefully and answer the questions that follow.

14. Chlorobenzene is a compound that has a chemical formula of C_6H_5Cl. This liquid is flammable and is also known as a common solvent. Chlorobenzene is mainly used to manufacture chemicals. The main use of this compound is to produce commodities that include herbicides, rubber, and any other dyestuffs. Chlorobenzene once was used in the manufacture of pesticides, most notably DDT, by reaction with trichloroacetaldehyde, but this application has declined with the diminished use of DDT. At one time, chlorobenzene was the main precursor for the manufacture of phenol.

a) The electrophilic substitution reactions in Chlorobenzene occur slowly, Why?

b) How would you prepare Phenol from Chlorobenzene?

c) Chlorobenzene is extremely less reactive towards nucleophilic substitution reactions. Write any two reasons.

OR

c) Name the reagents needed for the preparation of 4-Nitrophenol starting from Chlorobenzene. Also, write chemical equations.

SECTION E [5 X 1 = 5]

The following question is a long answer type and carries 5 marks. This question has an internal choice.

15. a) Write the mechanism for dehydration of Ethanol under acidic conditions at 443 K.

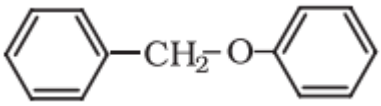
b) How are the following conversions carried out?

i) Phenol to Toluene

ii) Phenol to Ortho hydroxybenzoic acid

OR

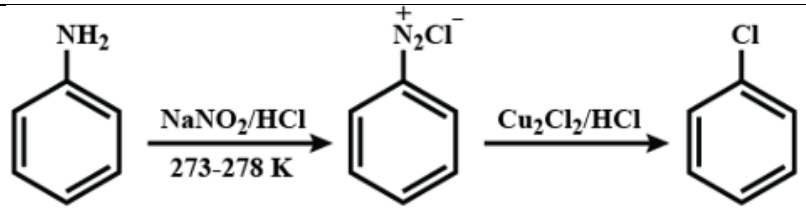
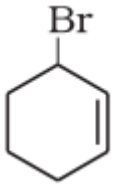
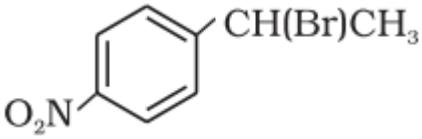
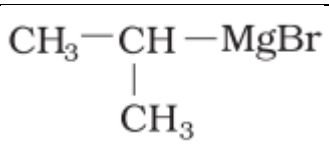
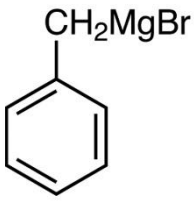
a) Give the major products that are formed by heating the following ether with HI.

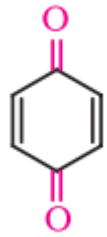
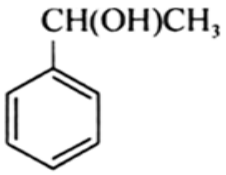
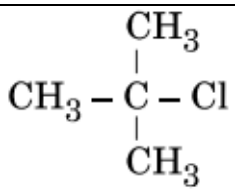
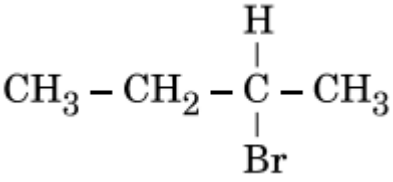
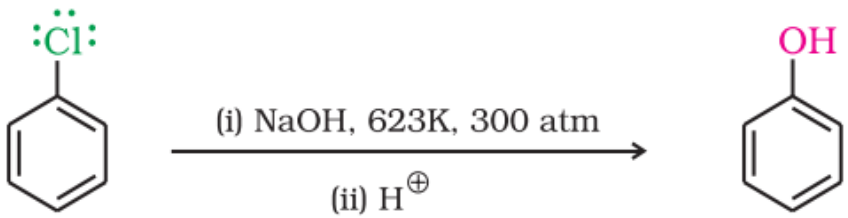


b) How will you convert Propanone to 2-Methylpropan-2-ol

c) Explain the mechanism for acid catalysed hydration of an alkene to alcohol.

MARKING SCHEME

1.	(C) CrO_3	**1**
2.	(A) p-Cresol < Phenol < p-Nitrophenol	**1**
3.	(C) Ethoxyethane and Ethene	**1**
4.	(A) Sulphuric acid is a strong oxidising agent	**1**
5.	(B) Pentane	**1**
6.	(D) 2,5-Dimethylhexane	**1**
7.	(A) Both A and R are true and R is the correct explanation of A.	**1**
8.	(D) A is false but R is true.	**1**
9.	A – $CH_3CH(Br)CH_3$ B – $CH_3CH=CH_2$ C – $CH_3CH(OH)CH_3$ D – CH_3COCH_3	½ ½ ½ ½
10.	a) $CH_3CH_2CH_2OH$ b) $(CH_3)_2C=CH_2$	**1** **1**
11.	a)  b) i)  ii) 	**1** **1** **1**
12.	a) i)  ii) 	**1** **1**

	b) Due to resonance, C-O bond in phenol has partial double bond character and but no resonance in methanol / sp^2 hybridised carbon atom in phenol, sp^3 hybridised carbon atom in methanol. **OR** a)  b)  c) $C_2H_5I + C_6H_5OH$	**1** **1** **1** **1**
13.	a)  More the branching, lower the surface area. b) 2-Bromo-2-methylbutane It is a tertiary alkyl halide. It forms a more stable tertiary carbocation. c)  It contains a chiral carbon (carbon attached to four different groups).	½ ½ ½ ½ ½ ½
14.	a) This is due to the electron withdrawing nature of chlorine (-I effect). It deactivates the benzene ring. b)  c) (i) Resonance effect: C—Cl bond acquires a partial double bond character due to resonance.	**1** **1** **1 + 1**

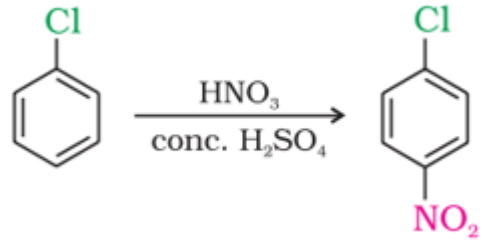
(ii) Difference in hybridisation of carbon atom in C—X bond: In haloalkane, the carbon atom attached to halogen is sp^3 hybridised while in case of haloarene, the carbon atom attached to halogen is sp^2 hybridised.

(iii) Instability of phenyl cation: In case of haloarenes, the phenyl cation formed as a result of self-ionisation will not be stabilised by resonance.

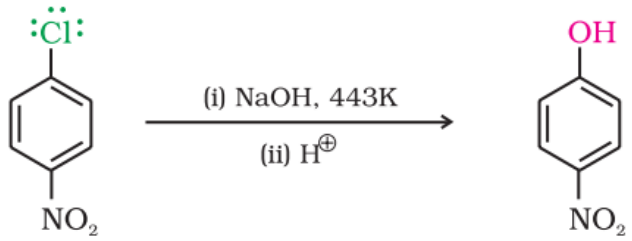
(iv) Because of the possible repulsion, it is less likely for the electron rich nucleophile to approach electron rich arenes. ***(Any two)***

OR

c) Conc. HNO_3, Conc. H_2SO_4, NaOH, H^+(aq), 443 K **1**

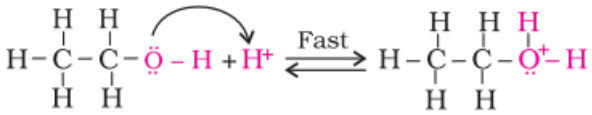


½

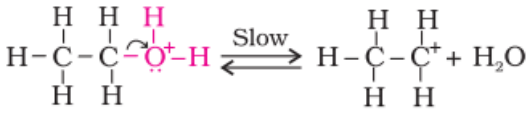


½

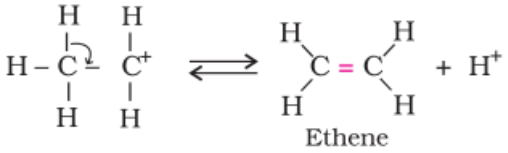
15. a) *Step 1:* Formation of protonated alcohol. **3**



Step 2: Formation of carbocation: It is the slowest step and hence, the rate determining step of the reaction.



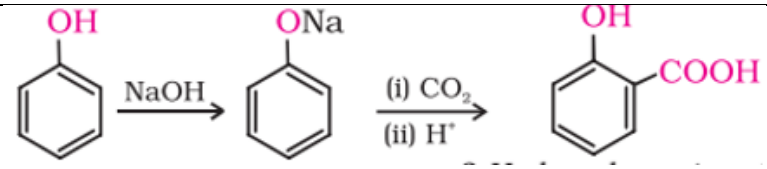
Step 3: Formation of ethene by elimination of a proton.



b) i) $C_6H_5OH \xrightarrow{Zn\ dust,\ heat} C_6H_6 \xrightarrow{CH_3Cl,\ Anhyd.AlCl_3} C_6H_5CH_3$ **1**

1

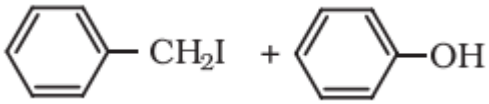
ii)



1

OR

a)



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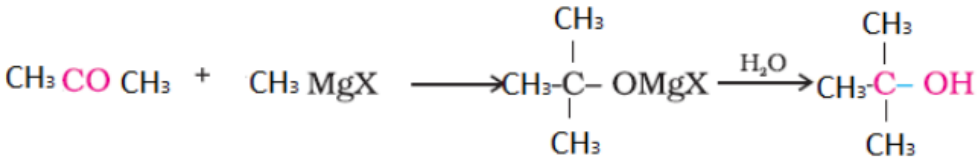
b)



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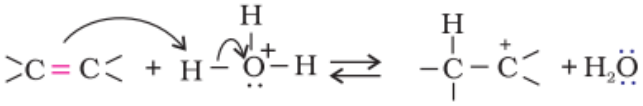
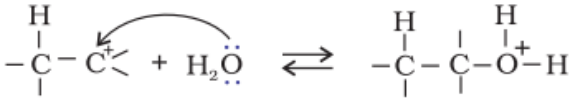
c) Step 1: Protonation of alkene to form carbocation by electrophilic attack of H_3O^+.

$H_2O + H^+ \rightarrow H_3O^+$



Step 2: Nucleophilic attack of water on carbocation.



Step 3: Deprotonation to form an alcohol.